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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/719,759	11/20/2003	Chin-Ta Su	MXICP012	3129
25920 7590 09/07/2007 MARTINE PENILLA & GENCARELLA, LLP 710 LAKEWAY DRIVE SUITE 200 SUNNYVALE, CA 94085			EXAMINER MCDONALD, RODNEY GLENN	
			ART UNIT 1753	PAPER NUMBER
			MAIL DATE 09/07/2007	DELIVERY MODE PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

**Office Action Summary**

Application No.

10/719,759

Applicant(s)

SU, CHIN-TA

Examiner

Rodney G. McDonald

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 12 July 2007.
- 2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1,2,6-8,12,13 and 17 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2,6-8,12,13 and 17 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1, 2, 7, 8 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Giewont et al. (U.S. Pat. 6,388,327).

Regarding claims 1, 7, 8, 13, Giewont et al. teach a conventional process for formation of a cobalt silicide comprising providing a substrate having a silicon layer thereon. Precleaning the substrate. Depositing a cobalt layer thereon. Depositing a TiN capping layer on the cobalt. The conventional capping layer is not truly stoichiometric but includes additional nitrogen. (i.e. Nitrogen greater than 1 thus the TiN layer has x atoms of nitrogen for each atom of titanium greater than 0.9) . The structure

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is first annealed in the range of 480 to 570 degrees C. Since the capping layer includes additional nitrogen, nitrogen will diffuse into and through the cobalt layer 2 during the first anneal. During the first anneal the Co diffuses into the silicon to form a layer of CoSi<sub>12</sub>. Also the a nonreacted Co layer 22 is formed. The TiN layer and the unreacted Cobalt layer is removed leaving a layer of CoSi. A second anneal can then be carried out to form a layer of CoSi<sub>2</sub> in the range of 690 to 750 degrees C. The CoSi<sub>2</sub> is inherently decreased in resistance. (Column 1 lines 23-41; Column 2 lines 1-16; Column 28-51) The Ti is minimally diffused from the TiN<sub>x</sub> layer into the silicon layer due to the layer thickness of the TiN<sub>x</sub> layer being "about 200 Angstroms". (Column 2 lines 1-2) The TiN layer is formed by a sputtering process. (Column 1 lines 35-37) The gas used in the sputtering process is N<sub>2</sub> and Ar. (Column 1 lines 35-41)

Regarding claim 2, the second thermal process is performed after removing the non-reactive cobalt layer. (Column 2 lines 47-50)

The difference not yet discussed is the ratio of the nitrogen to argon gas being "approximately 3:1".

Giewont et al. teach that to form a titanium nitride film with excess nitrogen one should operate in region III. (See Fig. 2) The nitrogen flow can be increased above 60 sccm to achieve applicant's gas ratio. (See Fig. 2)

The motivation for operating with a N<sub>2</sub> to Ar ratio of 3:1 is that it allows formation of a film that has excess nitrogen. (Column 2 lines 29-31)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized a ratio of 3:1 as taught by Giewont et al. because it allows formation of a film with excess nitrogen.

Claims 6, 12 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Giewont et al. (U.S. Pat. 6,388,327) in view of Besser et al. (U.S. Pat. 5,970,370).

Giewont et al. is discussed above and all is as applies above. (See Giewont et al. discussed above)

The difference between Giewont et al. and the present claims is the thickness of the TiN layer.

Regarding claims 6, 12, 17, the thickness of the TiN layer can be 100 Angstroms. (Column 5 lines 48-51)

The motivation for utilizing a particular thickness of the TiN layer is that it allows for formation of a cobalt silicide structure. (See Abstract)

Therefore, it would have been obvious to one of ordinary skill at the time the invention was made to have modified Giewont et al. by utilizing a particular thickness of the TiN layer as taught by Besser et al. because it allows for formation of a cobalt silicide structure.

### ***Response to Arguments***

Applicant's arguments filed July 12, 2007 have been fully considered but they are not persuasive.

In response to the argument that Giewont does not teach the ratio of nitrogen to argon, it is argued that Giewont teach in the "Conventional process" that the TiN

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capping layer can have an additional amount of nitrogen in the layer which reads on Applicant's requirement for a  $TiN_x$  layer where X is greater than 0.9. The claims as written can read on a stoichiometrically balanced TiN layer or a layer where there is more nitrogen than Ti. Giewont teaches the case where there is more N than that required by a stoichiometric layer of TiN. It is argued that Giewont teach operating in the region of III in Figure 2 to produce a layer having additional nitrogen. Operating at such a range will lead to a nitrogen to argon ratio of "approximately 3:1". (See Giewont discussed above)

In response to the argument that Giewont teaches away from using an excess amount of nitrogen, it is argued that Giewont teach a conventional process, which uses excess nitrogen. The Examiner relies only on this conventional process teaching to teach use of excess nitrogen. As such the conventional process does not teach away from using excess nitrogen. (See Giewont discussed above)

### ***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

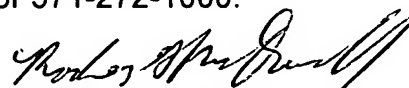
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the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rodney G. McDonald whose telephone number is 571-272-1340. The examiner can normally be reached on M-TH with every Friday off..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Rodney G. McDonald  
Primary Examiner  
Art Unit 1753

RM

September 5, 2007